EVALUATION OF INFRASTRUCTURE INFORMATION TECHNOLOGY GOVERNANCE USING COBIT 4.1 FRAMEWORK

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***Abstract*— Information technology infrastructure provide the foundation for capabilities information technology used to build business applications and is usually managed by a group of information systems. Objective of this study was to evaluate the IT governance of the university on UPT-SIM to find out the problems that occur in the infrastructure and measures maturity level management of information technology infrastructure resources. The use of information technology as supporting the achievement of organizational goals and objectives must be balanced with the effectiveness and efficiency of management. This study uses COBIT framework ver 4.1 for testing and measuring the effectiveness of information technology infrastructure in the IT Process of PO3, AI3, DS1, DS3, DS6, DS9, DS13, ME4. The data obtained from the measurements of the maturity level that is on level 2 repeatable but intuitive will be used as an analysis of the IT governance situation that will be proposed for infrastructure improvements and appropriate management based on COBIT 4.1.**

Keywords-Infrastructure of Information Technology; COBIT 4.1; Maturity Level

I. INTRODUCTION

Information Technology (IT) plays a role in an organization to support the achievement of organizational goals. To achieve these objectives it is necessary to ensure the alignment (IT Alignment) between Information Technology Architecture with the vision and mission of the organization. The process of strategic management of information technology can be used to understand the competitive forces and develop a competitive advantage in a systematic, consistent, and continuous line with the trend in the new competition based on technological developments and globalization.

To ensure that IT governance in line with the organizations strategic and goals evaluation of IT governance is needed to determine the extent to which IT governance are applied and managed correctly. In practice, the stage of evaluation of IT governance is not different from the audit in general. Planning stages, as a preliminary, it is absolutely necessary to be familiar with the object to be examined. In addition, must ensure that qualified resources already owned, in this case experienced human resources and also a reference of best practices. This planning phase will result in an evaluation program that is designed in such a way that its implementation will be effective and efficient, and done by people who are competent, and can be completed in according to what agreed upon.

Considering the importance of information technology for the smooth operation of services will require proper management of information technology. The evaluation of IT governance needs to be done to see and maximize the information technology. Without proper management of the information technology services delivered will not be given fullest. The use of the proper framework can be maximizing the management of information technology.

II. MATERIALS

A. IT Governance

Van Grembergen [6] include some understanding of IT governance by some parties as shown in table 1.

TABLE I. THE DEFINITION OF *IT GOVERNANCE*

• "*The organizational capacity to control the formulation and implementation of IT strategy and guide to proper direction for the purpose of achieving competitive advantages for the corporation"* *The Ministry of International Trade and Industry* (1999)
• "*IT governance is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consist of the leadership and organizational structure and processes that ensure that the organization's IT sustain and extends the organizations' strategy and objectives"* *IT Governance Institute (2001)*
• "*IT governance is the organizational capacity exercise by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT"* *Van Grembergen (2002)*

Despite of some understanding of identified earlier differ in some aspects, but can be concluded all mainly focus on several things, such as the relationship between business and IT. Some also expressed understanding that there is an important role in the implementation of IT governance management.

Information Technology highly related in the present and spreads in various areas in the company, managers should give special attention to IT, review how the company's dependence on IT and how important IT for the implementation of business strategies, [5] due to:

1) IT is critical in supporting and achieving company goals
2) IT is strategic to the business (development and innovation)
3) The increasing demand persistence relative to the IT implications in terms of mergers and acquisitions.

Focus areas of information technology governance shows executive management topics necessary to put the management of IT in his company. According to ITGI there are five areas to be focused on the information technology governance as shown in figure 1 [1]

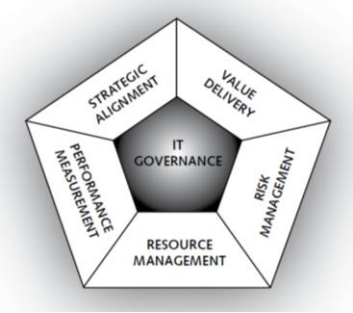

Figure 1. IT Governance focus area ITGI, 2003.

1) *Strategic alignment* focuses on ensuring the linkage of business and IT plans; defining, maintaining and validating the IT value proposition; and aligning IT operations with enterprise operations
2) *Value delivery* is about executing the value proposition throughout the delivery cycle, ensuring that IT delivers the promised benefits against the strategy, concentrating on optimizing costs and proving the intrinsic value of IT
3) *Resource management* is about the optimal investment in, and the proper management of, critical IT resources: applications, information, infrastructure and people. Key issues relate to the optimization of knowledge and infrastructure
4) *Risk management* requires risk awareness by senior corporate officers, a clear understanding of the enterprise's appetite for risk, understanding of compliance requirements, transparency about the significant risks to the enterprise and embedding of risk management responsibilities into the organization
5) *Performance measurement* tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery, using, for example, balanced scorecards that translate strategy into action to achieve goals measurable beyond conventional accounting.

B. IT Infrastructure

In information technology resource management infrastructure is one important resource. According to ITGI [2] infrastructure is a technology and facilities (such as hardware, operating systems, DBMS, networking, multimedia, and the environment that surrounds and supports) that enables the processing of applications.

According to Gupta [3] information technology infrastructure of an organization consisting of equipment, software, hardware or other components needed to provide IT services for consumers. Infrastructure also provides a basis on which the program or project-specific systems and capabilities of an organization is created.

IT infrastructure management aims to manage these components to use effectively in the provision of the best service for consumers.

C. COBIT

COBIT is a collection of documentation best practices for governance of information technology (IT) that can help the auditor, the user, and management, in order to bridge the gap between business risks, control needs and technical problems of IT [2]. COBIT is used to carry out the determination of the IT and improve IT controls. COBIT also contains control objectives, audit guidance, performance and outcome metrics, critical success factors and maturity models.

Control Objectives, is the highest level and in general that provide the best minimal control statement. Control Objectives, is the highest level and in general provide the best minimal control statement. COBIT assumes the design and implementation of automated application controls are the responsibility of IT, covers the acquisition and implementation, based on business requirements defined in COBIT standards. Control Objectives consist of four major domains:

1) *Plan & Organize*, this domain covers strategy and tactics, and concerns the identification of the way IT can best contribute to the achievement of the business objectives, the realization of the strategic vision needs to be planned, communicated and managed for different perspectives. A proper organization as well as technological infrastructure should be put in place
2) *Acquire & Implement*, to realize the IT strategy, IT solutions need to be identified, developed or acquired, as well as implemented and integrated into the business process. In addition, changes in and maintenance of existing systems are covered by this domain to make sure the solutions continue to meet business objectives,
3) *Deliver & Support*. this domain is concerned with the actual delivery of required services, which includes service delivery, management of security and continuity, service support for users, and management of data and operational facilities

4) *Monitor & Evaluate*, all IT processes need to be regularly assessed over time for their quality and compliance with control requirements. This domain addresses performance management, monitoring of internal control, regulatory compliance and governance.

Capability Maturity Model (CMM is a framework for assessing the level of maturity of the development of an organization's information systems and management processes and products. CMM maturity level consists of 6, among others [2]:

TABLE II. MATURITY LEVEL

Level	Criteria
0 – Non-Existent	Complete lack of any recognisable processes. The enterprise has not even recognised that there is an issue to be addressed
1 – *Initial/Ad Hoc*	There is evidence that the enterprise has recognised that the issues exist and need to be addressed. There are, however, no standardised processes; instead, there are ad hoc approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganised.
2 – *Repeatable but Intuitive*	Processes have developed to the stage where similar procedures are followed by different people undertaking the same task. There is no formal training or communication of standard procedures, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.
3 – *Defined Process*	Procedures have been standardised and documented, and communicated through training. It is mandated that these processes should be followed; however, it is unlikely that deviations will be detected. The procedures themselves are not sophisticated but are the formalisation of existing practices.
4 – *Managed and Measureable*	Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. Processes are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.
5 – *Optimized*	Processes have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

III. METHOD

Research design that will be used in this research is descriptive design is explorative in order to describe the condition or status of the phenomenon. This research will evaluating IT Governance at UPT-SIM in university to find out the problems that occur in the infrastructure and measuring maturity level the management of information technology infrastructure resources.

The population used in the sample data in this study were all members of staff UPT-SIM numbering 12 people, because as the number of employees working at UPT-SIM numbering 12 people.

Measurements were performed by spreading two kinds of questionnaires, namely:

1) *Management awareness*
   This measurement is done by asking questions about how important the processes that exist in the management of infrastructure resources.
2) *Maturity level*
   The measurement is done by asking questions about the condition of resource governance infrastructure at this time.

To determine how important the value of existing processes in the management of infrastructure resources, the questionnaire result translated in advance with the values:

a) A value of 1 for not very important
b) A value of 2 for not important
c) A value of 3 for a little important
d) A value of 4 for important
e) A value of 5 for the highly important

To determine the level of maturity level each value was mapped IT Process maturity level specified conditions COBIT framework into value with a scale of 0 to 5

a) A value of 0 for non-existent
b) A value of 1 for the initial
c) A value of 2 for repeatable
d) A value of 3 for defined
e) A value of 4 for managed
f) A value of 5 for optimized

IV. RESULT AND DISCUSSION

A. IT Process

IT Process that is focused on this research is the management of infrastructure resources, based on COBIT 4.1 IT Process that can be identified can be seen as follow:

TABLE III. IT PROCESS FOR INFRASTRUCTURE RESOURCE MANAGEMENT

IT Process	*IT Domain*
PO3	*Plan and Organize*
AI3, AI5	*Acquire and Implement*
DS1, DS3, DS6, DS9, DS13	*Deliver and Support*
ME4	*Monitor and Evaluate*

IT Process is based on the Resource Management IT Governance focus area for the primary infrastructure resources.

B. Maturity Level

Based on the answers of the respondents' recapitulation, the obtained value of the current maturity is 2.39 in the range 0-5. Highest maturity values contained in the DS3 is equal to 2.9, while the lowest was on DS6 value of 2.1 which is almost as low as AI3 of 2.17. With the highest expected

value of the value of governance maturity at 5 on a scale of 0-5 means there is gap of 2.61.

TABLE IV. IT PROCESS FOR INFRASTRUCTURE RESOURCE MANAGEMENT

IT Process		Now	To be	Gap
PO3	*Determine Technological Direction*	2.27	5	2.73
AI3	*Acquire and Maintain Technology Infrastructure*	2.17	5	2.83
AI5	*Procure IT Resources*	2.46	5	2.54
DS1	*Define and Manage Service Levels*	2.24	5	2.76
DS3	*Manage Performance and Capacity*	2.9	5	2.1
DS6	*Identify and Allocate Costs*	2.1	5	2.9
DS9	*Manage the Configuration*	2.36	5	2.64
DS13	*Manage Operations*	2.65	5	2.35
ME4	*Provide IT Governance*	2.36	5	2.64
Overall maturity level		2.39	5	2.61

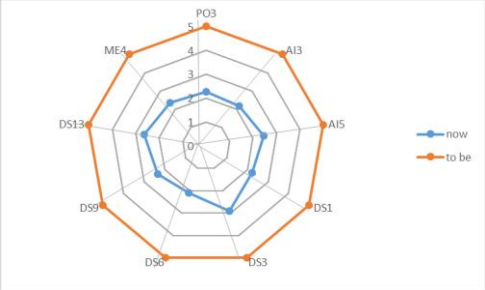

Figure 2. Maturity Level the Result

C. Management Awareness

Based on the result of the management awareness of infrastructure governance survey, IT Process showed that every IT Process is important, the average response for each IT Process at 4.72.

TABLE V. THE RESULT OF MANAGEMENT AWARENESS

IT Process		Level Of Importance	Importance
PO3	*Determine Technological Direction*	4.78	Important
AI3	*Acquire and Maintain Technology Infrastructure*	4.67	Important
AI5	*Procure IT Resources*	4.67	Important
DS1	*Define and Manage Service Levels*	4.71	Important
DS3	*Manage Performance and Capacity*	4.78	Important
DS6	*Identify and Allocate Costs*	4.67	Important
DS9	*Manage the Configuration*	4.75	Important
DS13	*Manage Operations*	4.78	Important
ME4	*Provide IT Governance*	4.71	Important
Overall Awareness		4.72	Important

D. General Picture

Some of the things found in the current infrastructure governance are:

1) *Determine Technology Direction*, Planning technology direction and planning of infrastructure technologies not yet documented. Determinations of the technology standards are not clear, although there are indications of regulation and monitoring of future technology trends. There is no IT Planning Council.
2) *Acquire & Maintain Technology Architecture*, Infrastructure procurement planning has been done well proven by the SIMPERANG (procurement information system) which can be accessed online. Infrastructure maintenance done regularly and there are procedures accordance with ISO 9001:2008. Eligibility Test (Feasibility Test) has not seen in the implementation and documentation.
3) *Procurement IT Resources*, Supervision of IT procurement has been done adequately. Contractual arrangements with the suppliers conducted agreement, even though there is only one supplier for the provision of internet line. Selection of suppliers is not done in a certain way, but it is done as needed.
4) *Define and Manage Service Levels*, There is no framework for service level management. So there is no explanation of the service definition. SLA and OLA has clearly specified the monitoring and reporting of service level achievements. A review SLAs and contracts conducted periodically.
5) *Manage Performance and Capacity*, A review of the performance and capacity of IT resources in this infrastructure has been done periodically, although not yet known the performance and capacity of IT resources to come.
6) *Identify and Allocate Costs*, The allocation of IT expenditures according to model of organizational expenses. Management of costs by different units, namely the Finance Department
7) *Manage the Configuration*, IT Configuration done well. There is a repository for all configuration information centralized IT. Management and configuration sections reviewing unity IT configuration.
8) *Manage Operations*, Defining; implementing and procedure have been made according to the procedures required. There is a job scheduling, processes, and IT implementation tasks. Supervision of the IT infrastructure are conducted regularly. Securing important documents and output devices as well as security for hardware maintenance done well.
9) *Monitor and Evaluate*, There is no corporate governance and risk management for information technology. IT resource management and performance measurement is well done. There are strategic alignment and value delivery, although not documented, and there are IT compliance with laws and regulations, organizational policies, standards and procedures.

V. CONCLUSION

Based on this research and the previous discussion we can conclude the following:

1) Based on COBIT framework 4.1, the management of the information technology infrastructure at UPT-SIM unit currently has a maturity index of governance is quite low at 2.39 (2-repeatable but intuitive), with conditions expected at the highest level (level 5 - Optimized).
2) Most respondents stated that the processes defined in the IT governance of infrastructures are critical.
3) There are nine IT Process in IT governance basic for infrastructure, namely: PO3, AI3, AI5, DS1, DS3, DS6, DS9, DS13, and ME4.
4) All IT Process at the same rank, an average of 2. With the highest maturity values contained in the DS3 is equal to 2.9, while the lowest was on DS6 value of 2.1 which is almost as low as AI3 of 2.17.

Some suggestions that can be given are:

1) The management should immediately create a strategic plan for information technology as the basis and foundation of the management and development of information technology.
2) Actions that need to be done by the management of which can initiated by recognizing the needs, well-documented everything relating to governance, measurement and evaluation continuously and periodically.
3) Adopting a framework for the governance of information technology that have international standard.

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